



PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference 72824-78236	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/IB2004/052762	International filing date (day/month/year) 10-12-2004	Priority date (day/month/year) 11-12-2003
International Patent Classification (IPC) or national classification and IPC See Supplemental Box		
Applicant Nordia Innovation AB et al		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 8 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
- a. ☒ (sent to the applicant and to the International Bureau) a total of 5 sheets, as follows:
- ☒ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
- ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
- b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).

4. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application |

Date of submission of the demand 11-10-2005	Date of completion of this report 28-02-2006
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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of: Cover sheet

INTERNATIONAL PATENT CLASSIFICATION (IPC) :

H04Q 1/14 (2006.01)

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Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

- ☒ the international application in the language in which it was filed
- ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of:
- ☐ international search (Rules 12.3(a) and 23.1(b))
- ☐ publication of the international application (Rule 12.4(a))
- ☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1 - 16 as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☒ the claims:
- pages _____ as originally filed/furnished
- pages* _____ as amended (together with any statement) under Article 19
- pages* 21 - 25 received by this Authority on 09-12-2005
- pages* _____ received by this Authority on _____
- ☒ the drawings:
- pages 1 - 13 as originally filed/furnished
- pages* _____ received by this Authority on _____
- pages* _____ received by this Authority on _____
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages _____
- ☐ the claims, Nos. _____
- ☐ the drawings, sheets/figs _____
- ☐ the sequence listing (*specify*): _____
- ☐ any table(s) related to the sequence listing (*specify*): _____

* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1 - 24</u>	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	<u>1 - 24</u>	NO
Industrial applicability (IA)	Claims	<u>1 - 24</u>	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The invention is intended to provide remote control for an automated cross-connect system.

Reference is made to the following documents:

D1: US 4833708 A
D2: US 6597784 B1
D3: US 4817134 A
D4: US 6265842 B1

Document D1 (column 6, line 64 - column 23, line 45, figures 1 - 2, abstract) shows a method and an automatic cross-connect system for use in a telecommunications network. The system includes subscriber lines (34a, 34b), a plurality of cross-connect cabinets (30a) with a plurality of plug-in cross-connect switch matrix cards (42) that are coupled to a main distribution frame (28) in a central office and a computer (14) that remotely controls automatic cross-connect devices. The computer (14) calls a selected telephone office supervisory control unit (22) via a dial up telephone line and sends cross-connect commands including cabinet (30) identity, the number of a selected switch matrix card (42), the relay number thereof, and an instruction, for example, to actuate or release the selected relay (column 14, lines 4 - 18, column 9, line 60 - column 10, line 49). The computer (14) maintains a database of information relating to present and planned cross-connect cabinet activity (column 7, lines 15 - 17). The supervisory control unit (22) of the telephone office maintains a record of the cross-connect map for each of the cross-connect

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Continuation of: Box V

cabinets (30, 30a) (column 15, lines 3 - 9, column 13, lines 50 - 54). The cross-connect register can be sent to the computer. The supervisory control unit (22) supplies commands and operating current to the selected cross-connect cabinet over a wire pair (26, 26a, 26b), see column 7, lines 22 - 46 and figure 1. Obviously, the coupling by plug-in makes it easy to reduce or increase the number of cross-connect switch matrix cards.

Document D4 (below) discloses a similar technique.

Document D2 (column 1, line 5 - column 7, line 35, figures 1 - 8C, abstract) shows a main distributing frame (MDF) having a function of automatically connecting and disconnecting between subscriber terminals and subscriber circuits of an exchange by employing a robot. The main distributing frame (MDF) has plural matrix switch boards (150).

Document D3 (column 1, line 5 - column 5, line 23, figures 1 - 6, abstract) shows a computer controlled cross-connect system (10) with a circuit board (19) having intersecting conductors that are mutually connected by contact sledges that are remotely controlled from a dispatching and maintenance center (17) via a central office (16).

Document D4 (column 20, lines 6 - 21, figures 17 - 37, abstract) shows a method and a remotely controlled cross-connection switching matrix for a telephone system. A matrix assembly (10), made up of circuit boards (11, 13, 15, 17) and a plurality of jumper pins (40), is coupled (inserted) in series with the customer lines (152, 153) between a mainframe (154) and the terminating equipment at a central office (156). All cross-connections can be made automatically from a remote location, see figure 17 and column 20, lines 6 - 21. Control signals from a telephone system central office are received by a modem (129) and a microprocessor (132), see column 17, lines 14 - 22, figure 11. An operator can select the cable pair and the line circuit to be interconnected (column 33, lines 4 - 16). The matrix assembly (10) may be used at a location remote from a telephone system central office or at the central office (column 19, lines 15 - 24). The remote control includes placing, moving and removing of cross-connections (column 33, lines 63 - column 64, line 2). The operator has a personal computer, a screen and access to a

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Continuation of: BOX V

database wherein the matrix connections are stored and updated (column 31, lines 51 - 54, column 33, lines 4 - 29). The operator can call a particular remote site having a cross-connect matrix system (column 32, lines 27 - 30). Thus, the method according to document D4 includes the steps of entering information into a remote terminal related to making a desired connection for establishing or removing a subscriber communication line, checking the current allocated resources relating to the MDF from a database and transmitting a command to the MDF.

The invention claimed in claims 1 and 13 differs from what is known from document D1, the closest prior art, essentially in that the main distribution frame has connector blocks and that the cross-connect switch matrix cards (boards) are coupled to the connector blocks.

The technical problem is unclear since the construction and arrangement of the connector blocks and how the boards are coupled to the connector blocks are not defined. If the meaning is that the boards are directly plugged into connector blocks of the main distribution frame, the technical problem is how to provide an alternative way to couple the boards to the main distribution frame.

The switch matrix cards (boards) of the system according to document D1 are coupled by plug-in to connectors that are connected to the main distribution frame.

Furthermore, main distribution frames usually have connector blocks for terminating subscriber lines and exchange lines, and plug-in of components.

Considering this and that no unexpected technical effect is obtained, it would be obvious to use such a main distribution frame and plug the cross-connect switch matrix cards (boards) into the connector blocks, thereby arriving at a system and a method having all the essential features of claims 1 and 13.

Therefore, the invention claimed in claims 1 and 13 is novel but lacks an inventive step. Claims 1 and 13 fulfil the requirement of industrial applicability.

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In case the space in any of the preceding boxes is not sufficient.

Continuation of: BOX V

In claims 2 - 12 and 14 - 24 slight constructional variations are suggested that are obvious to a person skilled in the art, especially considering the following reasons:

It is general common knowledge to communicate and control via Internet, Ethernet or LAN with TCP/IP-protocol.

The same or similar features are known in the same technical field from, for example, documents D1 - D4.

No unexpected technical effect is obtained.

Therefore, the invention claimed in claims 2 - 12 and 14 - 24 is novel but lacks an inventive step. Claims 2 - 12 and 14 - 24 fulfil the requirement of industrial applicability.

To sum up, the invention claimed in claims 1 - 24 is novel but lacks an inventive step. All the claims fulfil the requirement of industrial applicability.

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

In claim 13, line 21, the reference sign "352" is not placed in parentheses (Rule 6.2(b) PCT).

CLAIMS

1. An automated cross-connect system suitable for use in a telecommunication network central office comprising a network of communication lines for connecting subscriber locations to a central office exchange (112), said communication lines extend to the subscriber locations from a main distribution frame (MDF) (320) that comprises a plurality of connector blocks (210,220) housed therein for terminating the communication lines from to the subscriber locations and the lines from the exchange, such that the automated cross-connect system being capable of activating cross-connects between the subscriber communication lines and the exchange, **characterized in that** modular cross-connect boards, each including a switch matrix comprising a plurality of cross-connect elements, wherein said modular cross-connect boards are coupled to the connector blocks (210,220) in a scalable manner such that the MDF (320) is automated by selectively controlling the connection state of the plurality of cross-connects remotely via the central office.
2. An automated cross-connect system according to claim 1 wherein the remote computer terminal (350,352) communicates with a site controller (332) that supervises the MDF to identify the appropriate modular cross-connect board and the appropriate cross-connect for changing its connection state.
3. An automated cross-connect system according to claim 2 wherein the site controller (332) is linked to the cross-connect boards via a communication link that also provides power for automating the cross-connects.
4. An automated cross-connect system according to any one of the above claims wherein the switch matrix is comprised of sliding engagable contact sledges that are moved into position by an electric motor.
5. An automated cross-connect system according to any one of the above claims

wherein the switch matrix comprises a plurality of electrically conductive contacts disposed on PCBs by which any input line can connectable to any output line is achieved by the moving the sledges along different paths and transport planes.

5 6. An automated cross-connect system according to any one of claims 4 or 5 wherein the switch matrix further includes:

a bypass cross-connect for each line for bypassing the switch matrix if, upon installation of the cross-connect board, there is a pre-existing cross-connect made e.g. by jumper wire for the line, and

10 a reset position for each line for preserving an open line condition that is used when there is no jumper wire installed for the line upon installation of the cross-connect board or when the line is disconnected or removed.

7. An automated cross-connect system according to any one of the above claims
15 wherein the cross-connect boards are mounted in a center stage interconnecting the line side and exchange side communication lines within the MDF cabinet.

8. An automated cross-connect system according to any one of the above claims wherein the remote computer terminal communicates with the site controller via the
20 Internet, Ethernet, or LAN using TCP/IP based protocol, said remote computer terminal running network management application software (NMS) capable of selectively actuating all cross-connects within the system, verifying line connections, and running trouble shooting diagnostics.

25 9. An automated cross-connect system according to claim 8 wherein the NMS automatically checks, verifies, and establishes line connections in accordance with standard operator procedures.

10. An automated cross-connect system according to claim 1 wherein the cross-
30 connect boards are installed in MDFs with pre-existing cross-connections established by jumper wires without disrupting the existing connections.

11. An automated cross-connect system according to any one of claims 1 wherein the plurality of cross-connect boards are further located in street cabinets (328) and drop point sites (330) that are in communication with the site controller in a manner such that the plurality of cross-connects are selectively controlled by the remote computer terminal.

12. An automated cross-connect system according to claim 11 wherein the site controller communicates with the street cabinets and drop point sites via modems coupled to a communication link, and wherein power for actuating the cross-connects is supplied over the link.

13. A method of automating cross-connects using a scalable automated cross-connect system in a telecommunication network central office comprising a network of communication lines for connecting subscriber locations to the central office exchange (112), said communication lines extend to the subscriber locations from a main distribution frame (MDF) (320) that comprises a plurality of connector blocks (210,220) housed therein for terminating the communication lines from to the subscriber locations and the lines from the exchange, such that the automated cross-connect system being capable of selectively establishing cross-connects between the subscriber communication lines and the exchange, the method is **characterized by** the steps of:

entering into a remote terminal 352 information related to making a desired connection for establishing or removing a subscriber communication line;

determining the appropriate MDF in the telecommunication network central office;

checking the current allocated resources relating to the MDF from a database;

selecting an available communication line for connection to the exchange;

transmitting commands to the selected MDF comprising a plurality of modular cross-connect boards coupled to the connector blocks (210,220) in a scalable manner, wherein each including a switch matrix comprising a plurality of cross-connects;

identifying and selecting the appropriate modular cross-connect board and cross-connect to activate; and

remotely controlling the connection state of the selected cross-connect on the selected modular cross-connect board via the central office.

14. A method according to claim 13 wherein in the determining step the information is sent to a system gateway (354) which determines whether the subscriber communication line is accessible through the automated telecommunication system.

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15. A method according to claim 13 wherein the remote terminal is a computer running network management application software (NMS) transmits commands to a site controller (332) that supervises the MDF to identify the appropriate modular cross-connect board and the appropriate cross-connect for changing its connection state.

10

16. A method according to claim 15 wherein the site controller transmits commands to and provides power to the modular cross-connect boards via a communication link.

15

17. A method according to claim 13 wherein the switch matrix comprise a plurality of slidably engagable contact sledges for engaging pairs of electrically conductive contact pads for establishing cross-connects, wherein the contact sledges are moved into position by electric motors.

20

18. A method according to claim 13 wherein the system is scalable to the growth in subscriber lines within the MDF by coupling further modular cross-connection boards to available connector blocks (210,220).

25

19. A method according to claim 13 wherein the remote terminal communicates with the site controller via the Internet, Ethernet, or LAN using TCP/IP based protocol.

20. A method according to any one of claims 15 or 16 wherein the modular cross-connect boards are installed in street cabinets and drop point sites are automated for control by the remote computer terminal via the site controller, in which signals are transmitted and received via modems coupled to communication link.

21. A method according to claim 13 wherein the NMS automatically tests, verifies, and documents current line connections in accordance with standard operator procedures.

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22. A method according to claim 13 wherein the installation of the modular cross-connect boards into the connector blocks (210,220) is non-intrusive and does not disrupt the existing connections.

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23. A method according to claim 13 wherein in the transmitting step, a database is updated in accordance with the command for the associated the cross-connect.

15

24. A method according to claim 15 wherein when the route to the selected cross-connect is "blocked" due to existing connections on the cross-connect board and stage levels such that the site controller determines an alternative route for reaching the cross-connect while maintaining the existing line connections.